tion, their cosmology, ontology, their ethics and religion.

In a long article Prof. August Weismann expounds and defends his new theory of *Germinal Selection*, a modification of Wilhelm Roux's idea of the principle of selection as applied to the *parts* of organisms—the struggle of the parts. Weismann reviews the *whole* status of the problem of the efficacy of natural selection, attacks the doctrines of internal formative laws and of internal motive forces in evolution, ascribing all impulse and guidance in the choice of variations to utility. Establishing the efficacy of selection by what he deems indisputable evidence, he contends, nevertheless, that natural selection does not explain a very important *crux* of evolution, viz, why the useful variations are always present. Something is wanting to the selection of *persons*, and that missing agency is supplied by *germinal* selection, which the author claims is the last consequence of the application of the principle of Malthus to living nature, and has its roots 'in the necessity of putting something else in the place of the Lamarckian principle,' which is declared to be inadequate. His treatment of the views of American inquirers on this point shows a higher appreciation of the strength of their position than we are accustomed to expect from European critics. In opposition thereto, however, he maintains—and here the whole burden of his objection rests—that since degeneration takes place in superfluous parts having only *passive* and not active functions, as in the chitinous parts of the skeleton of Arthropoda, therefore, it is certain that the cessation of functional action is not the efficient cause of degeneration. It is a curious and instructive circumstance that he grounds his arguments upon the same facts as his opponents, viz., on the facts of artificial selection. He repudiates the charge that his germ elements are modernized reproductions of Bonnet's preformations, and also argues for the simplicity of his theory of the constitution of the germinal substance as compared with that of Spencer. The mechanism of the selection and survival of the plus and minus determinants in Weismann's theory of the *germinal* battle for life is that of oscillations of the nutrient supply and of the *active* as well as passive assimilative powers of the struggling particles.

In the last article, *On the Nature of Mathematical Knowledge*, Prof. H. Schubert, of Hamburg, shows the varying degrees of certainty attainable in the different branches of mathematics as compared with each other and with the remaining sciences, and points out the leading features by which mathematical thought is distinguished from other rational processes.

Prof. Henry F. Osborn reviews the late Mr. Romanes's *Post-Darwinian Questions*. Other important works in science and philosophy also receive critical discussion.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON. 253D MEETING, SATURDAY, JANUARY 11.

GERRIT S. MILLER read by title a paper on *the Sub-genera of voles* (*Microtinæ*).

T. S. Palmer spoke on *Rabbit Drives in the West*, illustrating his remarks with lantern slides. He alluded to the great destruction caused by the introduction of rabbits into New Zealand and Australia, and the efforts to check their increase, and described the damage to fruit and other crops in California. The drives were undertaken with the object of reducing the numbers of the rabbits and the principal locality where they were held was in the San Joaquin valley. The method was practiced on a limited scale by the Indians as far back as 1839, but the first of the modern drives by whites took place at Pixley, Cal., in November, 1887. The principle of a drive was as follows: A corral or pen of some kind was built with wing fences leading from it for a long distance, like a funnel, and a multitude of people, who assemble in response to notices and advertisements form a line and drive the rabbits toward this trap. The line may be several miles in length and it is formed some distance from the pen. The rabbits which try to double on the line are killed with clubs, and when the others have been driven into the trap, gates are shut and all clubbed to death. The number destroyed in 208 drives, including under this head the 'shotgun hunts' of Colorado and Utah, was 459,000, the average per drive being about 2,200; the greatest number killed at any one time was in March, 1892, at Fresno, Cal.,

when 8,000 people participated and 20,000 rabbits were taken.

Rabbit driving has declined in the San Joaquin Valley during the last three years, but is now being actively prosecuted in northeastern California and in certain parts of Oregon and Idaho, while thousands of rabbits are killed annually in the Colorado and Utah hunts. Drives can only be used in the case of Jack rabbits, which do not burrow, but under favorable circumstances afford a most efficient means of keeping the animals in check.

Dr. V. A. Moore read a paper on *The Nature of the Flagella of Motile Bacteria with special reference to their value in differentiating species.*

The paper was a summary of the present knowledge of the nature and significance of the flagella, or organs of locomotion, of motile bacteria. A method seems not to have yet been formulated whereby uniform results can be obtained by different investigators. This fact renders the assertions of a few writers that the flagella are of specific diagnostic value somewhat questionable. The test of the differential importance of these filaments was applied to *Baccillus coli communis, B. typhosis and B. choleræ suis*, three species of bacteria closely related morphologically, but readily differentiated by means of physiological properties and their pathogenesis. The differences in the flagella of each of these species as found by different observers are as great as those found between the different species. The same is true of the Spirilla. The proposed classification of bacteria by Messea was shown by illustration to be of secondary importance, and the statements heretofore made concerning the specific value of the flagella were shown to be unreliable. The author favored the disposition of the flagella, as polar or diffuse, made by A. Fisher, who includes them in the characters of his subfamilies.

F. A. Lucas,
Secretary.

NATIONAL GEOGRAPHIC SOCIETY.

At the regular Friday evening meeting of the National Geographic Society held in Washington, D. C., January 10, Mr. Wm. Ellery Curtiss, of Washington, delivered a lecture, illustrated by lantern slides, on Venezuela; her government, people and boundary. The lecturer, who was formerly Chief of the Bureau of American Republics, discussed the form of government and institutions of the country and the character, manners and customs of the people. He dwelt particularly, however, on the boundary question, in certain of its phases, and set forth both the British and American contentions in the pending dispute.

GEOLOGICAL SOCIETY OF WASHINGTON.

At the fortieth meeting of the Society, on January 9th, the first paper read was by Mr. R. T. Hill, of the U. S. Geological Survey, *On the Agassiz Expedition to Panama and Costa Rica.*

Mr. Hill gave results and methods of studies of the geological structure, paleontology and geomorphology of the Isthmus of Panama, based upon observations made by him last year, when, under a furlough from the Survey, he spent several months in the work, under the auspices of Prof. Alexander Agassiz. Mr. Hill supplemented his remarks by calling attention to the great work Prof. Agassiz is doing for science in working out the geology of Tropical America, a region having the greatest bearing upon the interpretation of our whole continental history.

The speaker made acknowledgment to the following specialists who had determined for him the many different types of material entering into this complicated section: To Dr. Wm. H. Dall, of the Geological Survey, for a report upon the Tertiary mollusca; to Prof. R. M. Bagg, of Johns Hopkins University, for interesting determinations of the Tertiary Foraminifera; to Prof. J. E. Wolff, of Cambridge, to whom the petrographic specimens were assigned; to Mr. H. W. Turner, of the Geological Survey, for minute examination of certain important and apparently indeterminate earths; to Mr. Ahc̊ Sjogren, of Stockholm, Sweden, late of Costa Rica, for carefully prepared sections and collections; and to Mr. T. Wayland Vaughan, of the U. S. Geological Survey, for determination of the fossil corals. The reports of these specialists, together with Mr. Hill's discussion of the structure, history, and physical geography, have been prepared and are nearly ready for publication.

Three geologic sections of the Central Ameri-

can region were presented by the speaker. The first of these was across the continent along the line of the Panama Canal and Railway. This consists of a complicated plexus of marine sedimentaries (Eocene and Miocene Tertiaries) igneous rocks (basalts, augite porphyrites, augite andesite, trachitic tufa, rhyolitic tufa and other species) and ancient detritial formations, so concealed by dense vegetation and soil (the subaereal decay, which reaches to 100 feet or more in depth,) and confused by structural disturbance that its history is most difficult to interpret. Another section was given across the Republic of Costa Rica from Punta Arenas to Port Limon, showing the contrasts between the high plateau, of recent volcanic activity and the older phenomena of Panama. The third section was from the Caribbean coast to the high mountain summits in southern Costa Rica. It is impossible to give here the great amount of detail which these sections throw upon the petrography, paleontology, orogeny and geomorphology of this exceedingly interesting region, and present for the first time any comprehensive detail by which its history may be discussed.

The discussion of the time of the union of the continents was intentionally deferred to the final report, owing to the fact that it is so involved in hypothetical discussion by naturalists that the subject requires separate treatment. "The Isthmus," said the speaker, "entirely aside from this question of the union of the oceans, is of the greatest geologic interest."

For the information of the Department of the Interior, and under special instructions from the Secretary, Mr. George H. Eldridge has just made an investigation of the principal mineral resources of the Uncompahgre Indian Reservation in northeastern Utah, and has submitted his report through the director of the Geological Survey. Mr. Eldridge contributed an interesting account of Uintaite, or Gilsonite, the principal resource found and investigated. His paper will be printed in this journal.

Prof. Chas. D. Walcott entertained the Society briefly with the presentation and informal discussion of two series of lantern-slide views. The larger series represented some recent and ancient markings on the sea shore, and showed the results of experiments and observations made by him quite recently on the beach at Noyes Point, Rhode Island, and on the Florida coast. The observations, while of interest in other respects, were presented more particularly as illustrating some supposed errors in the interpretation that observers have placed upon certain sea-shore markings. He illustrated among other things an excellent cast of a medusa, or jelly fish, one of several of which casts he had succeeded in making in plaster of paris while on the Florida coast. The other slides represented the mode of formation of sand dunes, as observed on the Rhode Island coast.

W. F. MORSELL.

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON.

THE 242 meeting of the Society was held on January 7. A paper on 'A Vigil of the Gods,' was read by Dr. Washington Matthews, U. S. A., of which the following is an abstract:

The rites occur on the fourth night of a great nine-days' ceremony of the Navahoes called the night-chant, which is based on a myth, and many of the acts are illustrative of the mythic events.

The night from about 9 P. M. until daylight is devoted to a vigil analogous to that of the mediæval knight over his armor. Men and gods, or the properties which represent the gods, alike participate in the vigil and there is a feast in common, or love-feast, closely resembling certain ceremonial acts observed among our own people to-day.

Although there are interesting rites, the night is spent mostly in song, and many long prayers are repeated. The songs and prayers are carefully formulated ritualistic compositions.

The masks of twenty-one gods and goddesses of the Navaho pantheon, along with other sacred properties, are spread on a buffalo robe in an established order and frequent sacrifices of pollen are made to them.

Early in the night dishes of wild herbs and seeds, such as formed the food of the Navahoes in the old days, before they became farmers and herders, are brought in, sung over and eaten by those who choose to partake.

The love-feast comes later. This consists of cold cornmeal gruel, or thin mush, prepared in

a water-tight wicker bowl with many ceremonial observances. The bowl is passed around sunwise and everybody helps himself with his fingers to four morsels. But before the men partake, the gods are fed—a morsel of gruel is laid on the mouth of each mask. After the gruel is finished all partake of pollen.

About midnight the ceremony of waking the gods begins. Although the Navahoes do not use time-pieces, this act occurs always almost exactly at midnight. The shaman sings a long song, the burden of which is Hyidezná (he stirs, he moves); a different god is mentioned in each stanza. When the singer mentions the name of a god he lifts the appropriate mask and shakes it in tune to the song. The last prayer occurs after dawn, the vigil ends, and the lodge is prepared for the work of the fifth day.

The paper closed by giving the reasons for certain Navaho symbolisms, especially that which assigns the north to the male and the south to the female.

The closing paper on *Racial Anatomical Peculiarities* was read by Dr. D. K. Shute.

George R. Stetson,
Recording Secretary.

NEW YORK ACADEMY OF SCIENCES.

In the absence of the President the meeting was called to order by Prof. R. S. Woodward. The minutes were read and approved and Dr. Franz Boas, of the American Museum of Natural History was elected resident member. Twenty-six members and guests were present. Prof. M. I. Pupin then read before the Section of Astronomy and Physics a paper on the *Magnetic circuit.* In transformers, especially of closed iron core, it has long been known that the upper 'harmonics' of the fundamental rate of alternations present in the primary are choked out by the transformer leaving the potential difference of the secondary coil represented by a simple sine curve. The choking out is less if the magnetic circuit is incomplete, and least when the coils have no magnetic core. Various explanations have been offered to account for this phenomenon; it is doubtless true that it is due to Foucault currents and to hysteresis. Dr. Pupin pointed out from certain mathematical considerations that by appropriate measurements, especially of the angle of lag, it would be possible to separate the energy consumed in Foucault currents from that consumed by hysteresis, and thus be able to study this latter puzzling phenomenon. Investigations are in progress to test the method experimentally. Prof. Crocker remarked upon the interest and importance of the questions involved.

The second paper was by Dr. A. A. Julien upon 'The condensed gas film on the surface of solid bodies with relation to (1) Newton's rings of the first order; (2) sand flotation; (3) sand in harmonic vibration.

Owing to the lateness of the hour Dr. Julien passed over the first two heads, giving an outline of the literature of the question of liquid films on solids. He then outlined his experiments in sonorizing sands artificially, and demonstrating the necessity of an antecedent water film before the sand becomes sonorous. It must also be of approximately uniform size of grain. The paper was discussed by Profs. Mayer, Van Nardroff, Pupin and Hallock. At 10:30 the meeting adjourned.

W. Hallock,
Secretary of Section.

GEOLOGICAL CONFERENCE OF HARVARD UNIVERSITY, DECEMBER 17, 1895.

The Geology of the Woonsocket Basin. (Preliminary Report.) By F. C. Schrader.

The basin consists of a local widening in the normally trenchant valley of the Blackstone River where the river traverses a narrow belt of soft rocks. The outline of the basin is roughly that of the cross-section of a plano-convex lens, whose straight edge, representing the southeast side of the basin, extends from Primrose, south of Woonsocket Hill, in Rhode Island, ten miles northeastward to South Bellingham, in Massachusetts. The convex edge includes near its middle point Blackstone village on the northwest, whence the Blackstone river, like a vertical let fall to the opposite side just below the city of Woonsocket, bisects the basin, whose width is here about three miles.

The rocks in the basin are eroded to a depth of two hundred or more feet below the upland or old baselevel of the surrounding country. Some bed-rock hills are, however, still prominent

within the basin, and the deposits of glacial drift, chiefly water-laid, frequently approach a hundred feet in thickness.

The rocks enclosing the basin are mainly gneisses, hornblende granites, and, on the west, some quartzites. Excepting a few of the granites, they are all Pre-Carboniferous and extend over wide areas of country. They have a southeast-northwest trend, and the gneisses and quartzites dip to the northeast, as seen in the Manville section and at Woonsocket Hill. Compared to the rocks within the basin, they are hard and form good resisters to weathering. To this difference of resistance to weathering between the extra- and the intra-basin rocks, the basin doubtless mainly owes its present topography.

The rocks within the basin are soft, have a southwest-northeast trend, and dip northwest. They are much younger than the enclosing rocks, with which they exhibit marked unconformities, as with the quartzites on the west and the gneisses on the north. The lowest and apparently oldest of these rocks, but of unknown age, is a uniformly very fine grained, grey, talcose, silicious mica-schist, which in the past has been worked with profit in the whetstone industry. It occurs chiefly in the southeast side of the basin. Above this grey rock, but unconformable with it, in the west part of the basin, is found a shiny black hornblende mica-schist, also of questionable age; while unconformably over both the grey and the black lie the youngest rocks in the basin. These latter, though as yet they have yielded no fossils, are probably Carboniferous, judging from their geological relations and lithologic resemblance to the well-known Carboniferous on the east, in the Narragansett Basin. They consist of grey conglomerates with interbedded mica-schists, sandstones and slates. They are derived chiefly from the surrounding older rocks of the upland, as is manifest by the granite and quartzite pebbles contained in the conglomerates, occurring east of Forestdale and at Woonsocket Hill.

Cutting the rocks in the basin at intervals is a series of diabase dikes. They range from less than one to more than a hundred feet in width, dip about vertical, and run nearly parallel, bearing north-northeast.

Preliminary Report on the Stamford Gneiss: By W. H. SNYDER.

In the southwestern part of Vermont and extending into the northwestern part of Massachusetts there occurs a coarse banded gneiss covering about 50 square miles and called by the U. S. Geological Survey the Stamford Gneiss. It was known in Pres. Hitchcock's survey of Vermont as the Stamford Granite.

This gneiss is surrounded on the east and south by a metamorphosed conglomerate, the pebbles of which correspond to the blue quartz of the gneiss. At a short distance from the contact the conglomerate changes into a micaceous quartzite. In this quartzite there has been found by Walcott trilobites which prove it to be Cambrian. On the west the gneiss appears to be bounded by a very massive white quartzite, the dip and strike of which mostly correspond to that of the micaceous quartzite on the east. The northern boundary is as yet undetermined.

At the contact of the conglomerate and gneiss there is developed between the two a layer of about a foot in thickness in which the gneissic structure is particularly pronounced, the mica making lenticular folds around the quartz grains and giving the mass the appearance of augen-gneiss. Prof. Pumpelly has suggested that this layer is the disintegrated border of the gneiss upon which the conglomerate was laid down and which has since been metamorphosed.

The gneiss itself is composed of coarse feldspar crystals, irregular masses of blue quartz and thin layers of a greenish mica. In some parts there are large Carlsbad twins of microcline and in others rounded masses of feldspar 3 and 4 inches in diameter. At one point the weathering has developed nodular feldspar aggregates as large as a hen's egg, which give the face of the ledge a conglomeratic appearance. The rocks yield easily to weathering throughout the area. There are no glacial striæ apparent upon any exposed surface.

Near the western border of the gneiss there is an outcrop of a fine grained greenish gneiss very distinct from that of the main mass and surrounded on three sides by this mass. The fourth side is hidden by a bog. The Stamford gneiss apparently overlies this gneiss and

sends apophyses into it. The contact between the two is distinctly marked, and although a careful microscopical examination has not as yet been made, it does not appear to be a metamorphic contact due to stretching, but an igneous contact, the Stamford gneiss having covered, when in a melted condition, the green gneiss. The Stamford gneiss is apparently a granite which has had the gneissic character impressed upon it.

The general occurrence, composition and structure of the Stamford gneiss corresponds very closely with the Rapakiwi granite of Finnland, described by J. J. Sederholm in Tschermak's Mineralogische und Petrographische Mittheilungen, Band XII., pages 1–31, 1891. Ueber die Finnländischen Rapakiwigesteine.

DECEMBER 10, 1895.

Preliminary Notes on the North Jersey Coast. J. Edmund Woodman.

Three important causes of change are now in operation here—submergence, recession and advance. The first is widespread, but immeasurable. The evidence relevant to this is varied, but chiefly the presence of stumps in salt and brackish water. Deepening of inlets affords no criterion.

Recession is effected by (1) waves, and (2) currents. On Sandy Hook and south of Manasquan inlet this is replaced by advance or grade; hence these are nodal points. This recession is measurable, and may be prophesied approximately for any specified time within certain limits. It can be temporarily prevented at isolated points, although not by present methods, but its ultimate conquest is sure.

The waves act (1) by eroding the shore; (2) by damming inlets, and (3) by transporting material off shore to form bars. Erosion is irregular, and in places erosion and advance alternate and partially compensate. Cutting is greatest with a northeast wind—*i. e.*, when wind and current are in opposition; it is least with a southeast wind. This is contrary to general theory, but is readily explainable. The damming of inlets is caused partly by coastwise bars raised by the waves and partly by sediment from the streams falling in the dead water where current and waves meet. Probably the former cause does not operate until some sedimentation has taken place. Most of the sand eroded from the shore is carried a few hundred feet out to form bars, little migrating along the margin of the land.

The currents act (1) by carrying a small amount of sand along shore as mentioned; (2) by the migration of bars northward—the most important method of transportation, and, as a result, (3) by deposition of most or all the sand on Sandy Hook.

T. A. Jaggar, Jr.,
Recording Secretary.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

At the meeting of January 6, 1896, President Green in the chair and eighteen other members present, the officers placed in nomination at the last meeting were declared as elected for the year 1896.

The reports for 1895 of the Treasurer and Librarian were read and accepted.

Prof. Engler pointed out a simple graphical method of drawing a normal to a parabola from a point outside the curve.

On motion of Prof. Pritchett, the Council was requested to arrange for a meeting of the Academy, in the near future, commemorative of the service of four distinguished men who had died in the past year: Dana, Helmholtz, Huxley and Pasteur.

Mr. Espenschied exhibited several samples of sisal and palm-fibre utensils obtained from the Bermudas and West Indies, explaining the mode of preparation.

Two new resident members were elected.

Wm. Trelease,
Recording Secretary.

NEW BOOKS.

Movement. E. J. Marey. New York, D. Appleton & Co. 1895. Pp. xv + 318. $1.75.

Computation Rules and Logarithms. Silas W. Holman. New York and London, Macmillan & Co. 1896. Pp. xlv + 73. $1.00.

Plant Breeding. L. H. Bailey. New York and London, Macmillan & Co. 1895. Pp. vii + 293. $1.00.

The Chemistry of Pottery. Karl Langenbeck. Chemical Publishing Co., Easton, Pa. Pp. vi + 197.